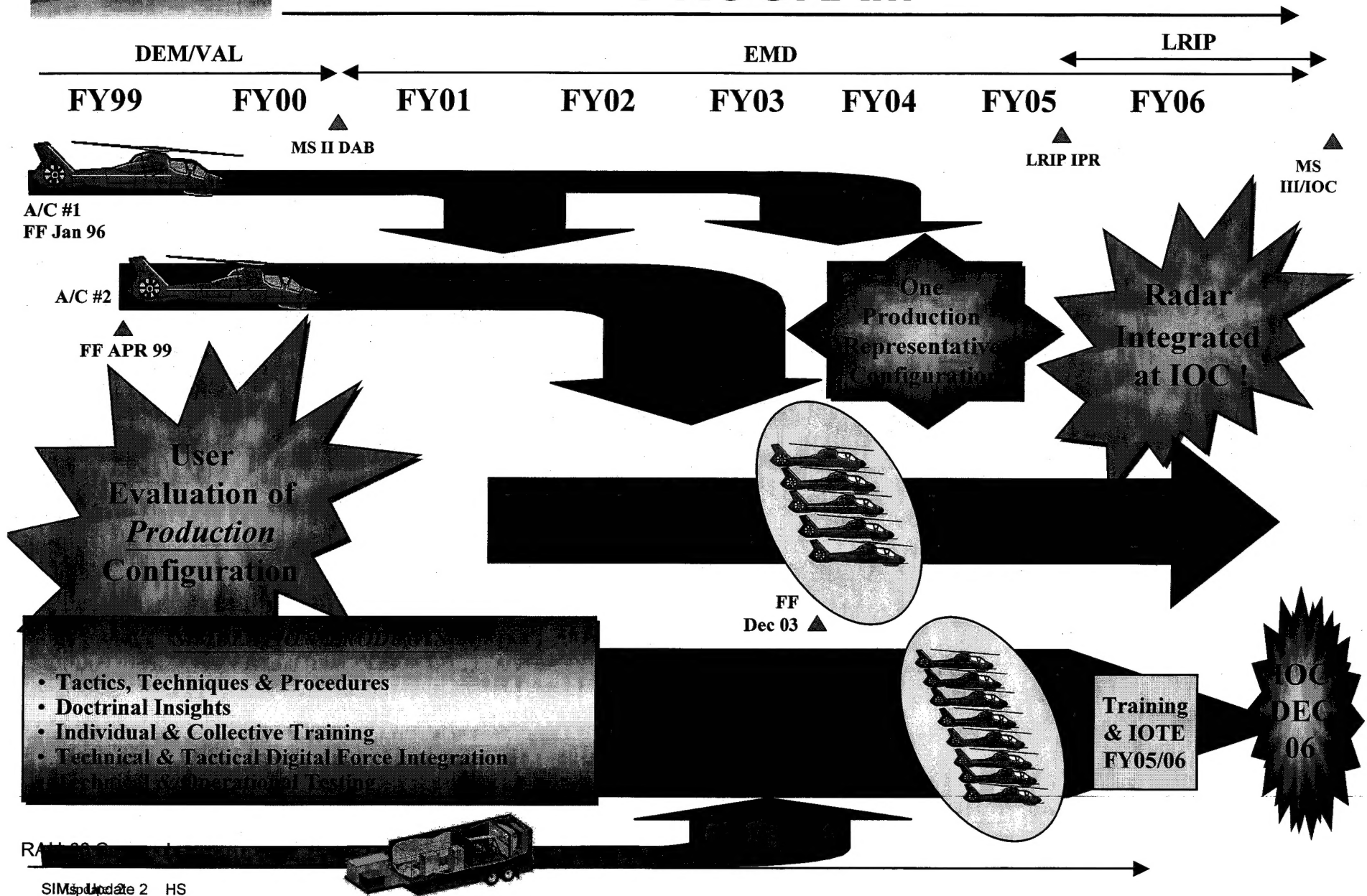# RAH-66 COMANCHE
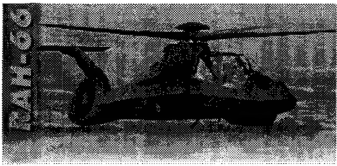
Comanche's Approach
to
Simulation Based Acquisition

Major Thom Crouch
APM Test & Evaluation
Office of the Program Manager - RAH-66 Comanche
e-mail: croucht@comanche.redstone.army.mil

COMANCHE PRE-PRODUCTION PROGRAM

DEM/VAL		EMD					LRIP

FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06

▲ MS II DAB

▲ LRIP IPR

▲ MS III/IOC

A/C #1
FF Jan 96

A/C #2

▲ FF APR 99

One Production Representative Configuration

Radar Integrated at IOC !

User Evaluation of *Production* Configuration

- Tactics, Techniques & Procedures
- Doctrinal Insights
- Individual & Collective Training
- Technical & Tactical Digital Force Integration

FF
Dec 03 ▲

Training & IOTE FY05/06

IOC DEC 06

SIM spdupdate 2   HS

Simulation Support Plan Evolution
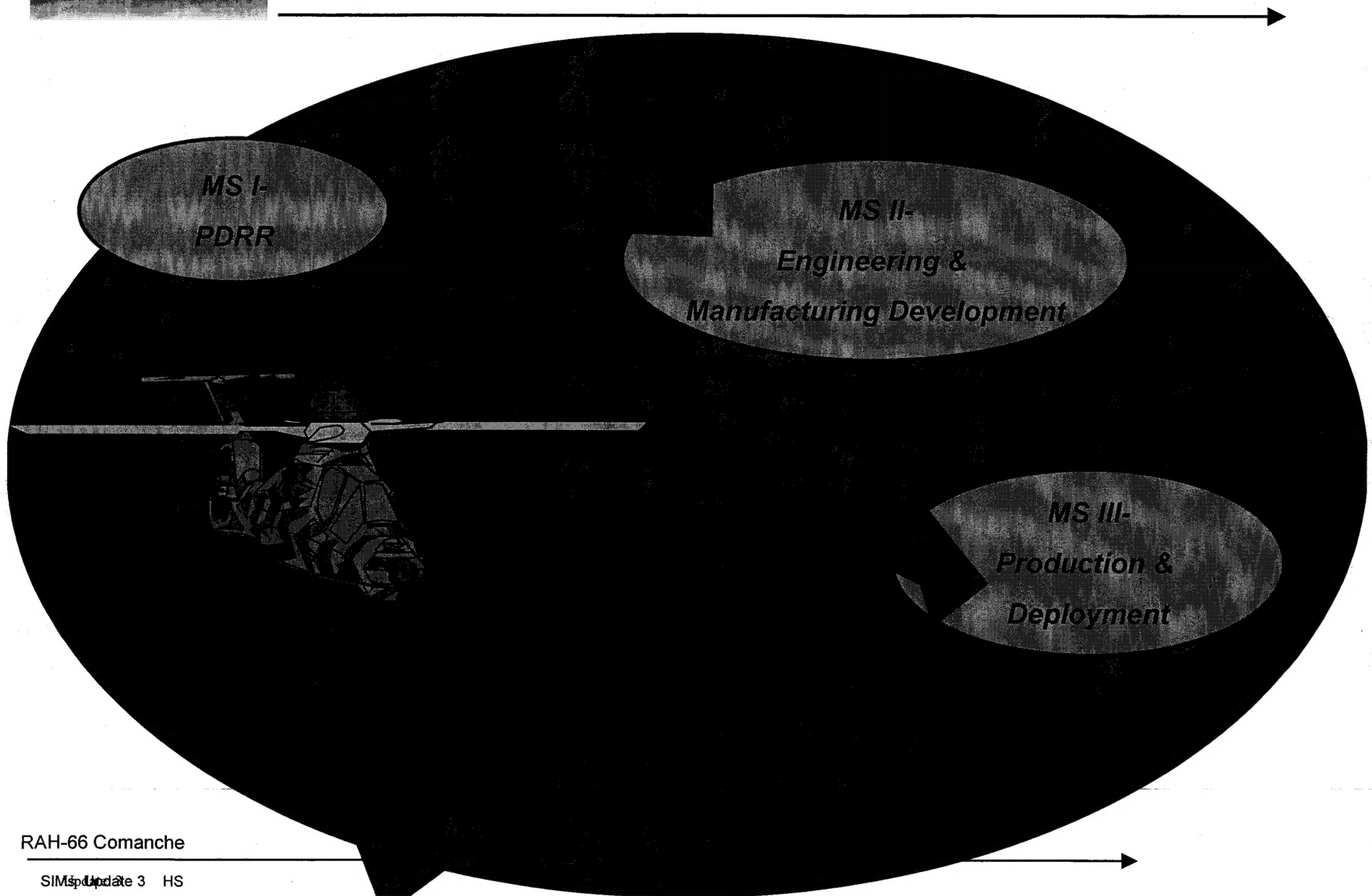
RAH-66 Comanche

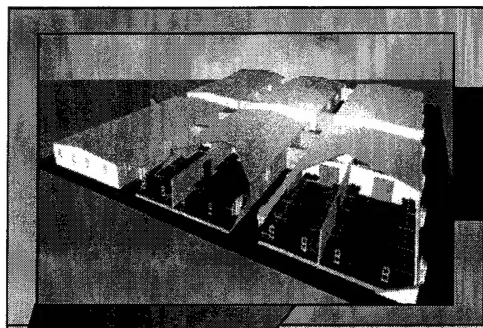SIMspUpdate 3   HS

MODELING and SIMULATION REQUIREMENTS

- **Engineering Development**
- **Pilot Vehicle Interface Analysis**
- **Test and Evaluation**
- **Tactics, Techniques and Procedures (TTP) Development**
- **AWE Support**
- **Individual Training**
- **Collective Training**
- **Support Requirements Determination**
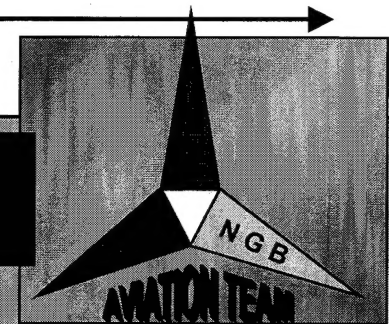- **Digital Interoperability (System Development)**
- **Demonstrations**

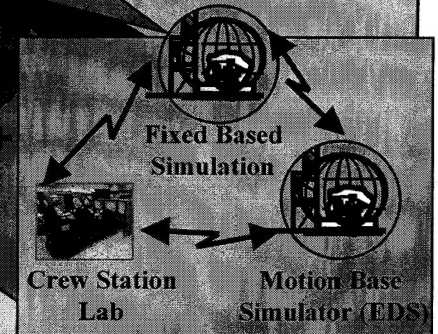*And Capability for Data Reduction and Analysis !*

SIMULATION TOOLSET

- **Tactics, Techniques & Procedures**
- **Doctrinal Insights**
- **Individual & Collective Training**
- **Technical & Tactical Digital Force Integration**
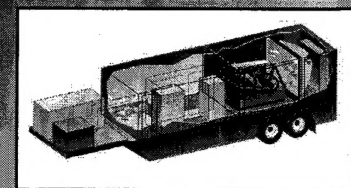- **Technical & Operational Testing**

AVCATT-A

NGB
AVIATION TEAM

Fixed Based Simulation

Crew Station Lab

Motion Base Simulator (EDS)

CTSF Integration Facility

CVC

COMANCHE VIRTUAL COCKPIT

MODSAF

ATSOM

CPC

COMANCHE PORTABLE COCKPIT

RAH-6

SIM Update 5   HS

SOFTWARE DROP SCHEDULE As of 25 Jan 99

| | FY97 | FY98 | FY99 | FY00 | FY01 | FY02 | FY03 | FY04 | FY05 |

Flt Plan, HIDSS(CRT), MAP Nav, MAP Window, Core Radios, Env Cueing, EOSS-EOTADS, NVPS, TTM/ATD/C

MS II

Customer Test I

Customer Test II

FDTE II

FDTE III

LRIP IPR

Event 1

Event 2 SYS STAT/SYS CNFG, Flight Plan (Static), Analog HIDSS, Map NAV, Core Radios, Env Cueing (prototype), EOC EOSS (EOTADS, NVPS, TTM/ATD/C), Map Window

Customer Test III

TAS OFP

11/01

Event 3 T801, ICNIA, Flight Plan (Edit), EOSS, Dig Com, ASE, Full TTM (ASE, Dig Com, Continue Scan), Envelope Cueing (Prod)

DROP 12 A/C Mission Computer S/W Development

10/03

Event 4 Full ATDC, Armament (TGS-HMD, Rockets FC, Hellfire), Fire Control Radar, Threat Envelope Display

DROP 13 A/C Mission Computer Software Development

5/04

Event 5 ARMAMENT (Full TGS Fire Control, Stinger) Flt Director (Coupled NAV, IFFC)

DROP 14 A/C Mission Computer Software Development

12/04

EVENTS DEVELOPED IN EDS

Event 6 TEF, Situation Assessment, EFAMS, Dig Com CAP

DROP 15 A/C Mission Computer Software Development

6/05

CPC /CVC Software Drops

TAS, 12 Drop 13   Drop 14 Drop 15
12/99   02/00   12/00   4/01

CVC's   CPC 1   CPC 3

12/99   4/00

Event ═══➤ **EDS & CPC**

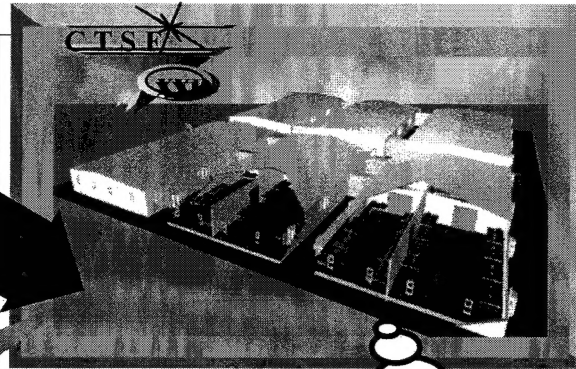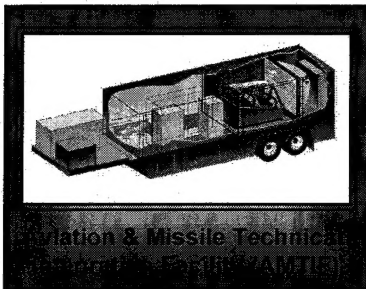▨─■─➤ **MEP/ A/C SOFTWARE**

SIM Update 6   HS

Central Technical Support Facility
Fort Hood, Texas

"Brings Together in one Place"
- Soldiers
- Combat Developer
- Industry
  - Software Programmers
  - Technicians
- Test Community
- Trainers
- Warfighter Systems

Interface to Army Battle Command System

Aviation & Missile Technical Support Facility (AMTSF)

Comanche Focus

Iteratively -
- Train
- Test
- Exercise
- Evaluate
- Improve & Enhance
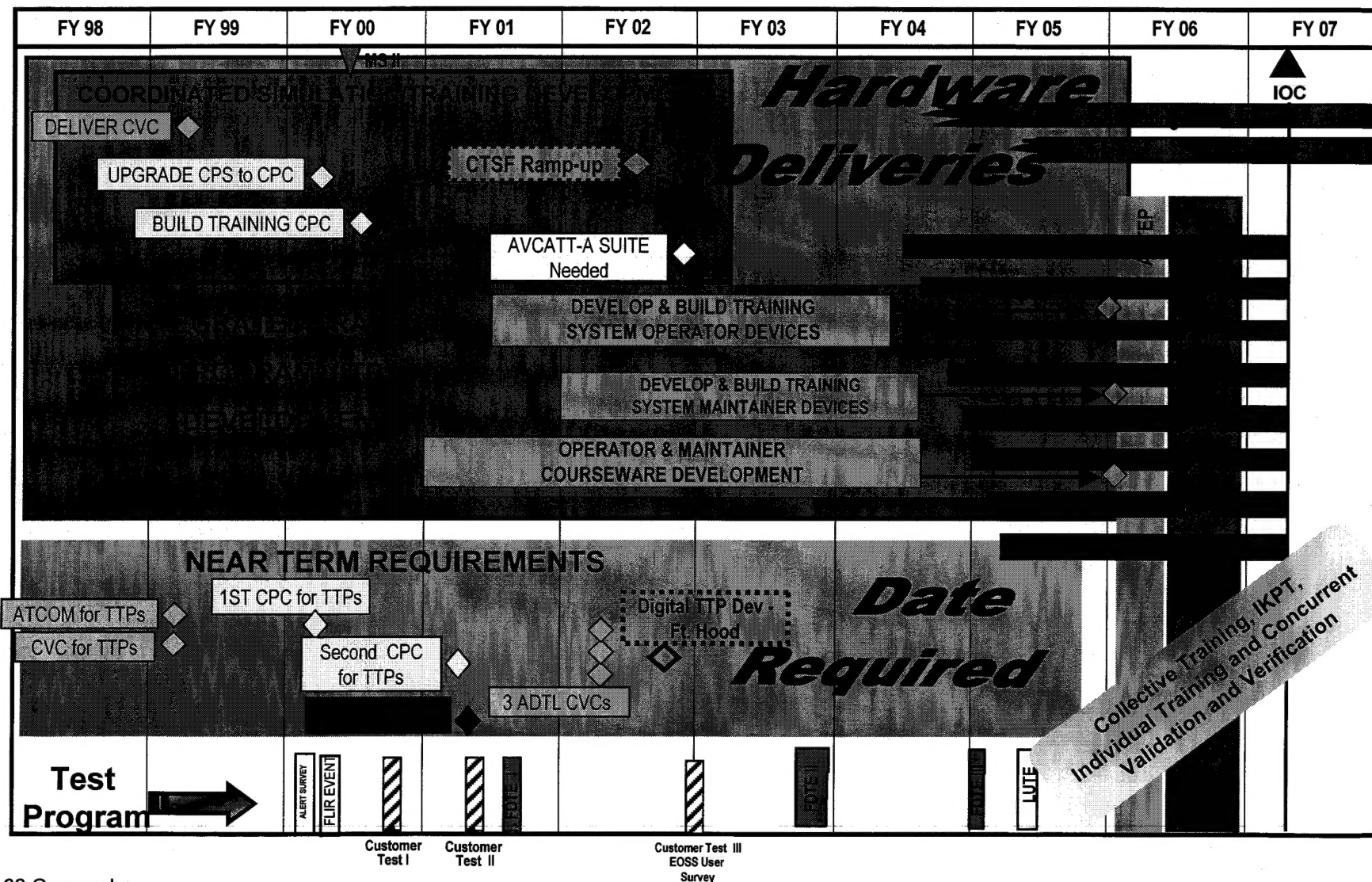
Refined and Enhanced Warfighter Tools (Every 3-4 Months)

Accelerated Modernization

Confirm Digital Interoperability with the Digitized Force

- *Hardware* - *Software* - *Digital Tactics, Techniques & Procedures*

SIMULATION AND TRAINING DEVICE SCHEDULES

FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07

HS II

IOC

COORDINATED SIMULATION TRAINING DEVELOPMENT

Hardware Deliveries

DELIVER CVC

UPGRADE CPS to CPC

CTSF Ramp-up

BUILD TRAINING CPC

AVCATT-A SUITE
Needed

DEVELOP & BUILD TRAINING
SYSTEM OPERATOR DEVICES

DEVELOP & BUILD TRAINING
SYSTEM MAINTAINER DEVICES

OPERATOR & MAINTAINER
COURSEWARE DEVELOPMENT

NEAR TERM REQUIREMENTS

1ST CPC for TTPs

ATCOM for TTPs

Digital TTP Dev
Ft. Hood

Date Required

CVC for TTPs

Second CPC
for TTPs

3 ADTL CVCs

Collective Training, IKPT,
Individual Training and Concurrent
Validation and Verification

Test Program

ALERT SURVEY

FLIR EVENT

Customer
Test I

Customer
Test II

Customer Test III
EOSS User
Survey

LUTE

RAH-66 Comanche

SIMspdupdate 8   HS

INTEGRATED TRAINING PROGRAM (ITP) REQUIREMENTS

- **Developed by the Contractor Concurrently With the Aircraft**

- **Developed IAW TRADOC Systems Approach to Training (SAT) Process**

- **Base Types, Quantities, Mix and Fidelity of Training Media on Results of SAT Process Analysis**

- **Include All Hardware, Software, Courseware, Documentation, Consumables and Facilities to Train Active and Reserve Components**

- **Train 100% of Critical Operator, Maintainer, and Support Tasks**

- **Tested, Validated, Verified and Ready for Training in the Training Base Prior to Initial Operational Capability**

ITP

Plus Total Training Support Package Development

EMBEDDED TRAINING CONCEPTS

User Requirement: Optimize the Use of Embedded Training

On Aircraft

- Operational Test, Training & Instrumentation System
- Aviation Survivability Equipment / Electronic Warfare (ASE/EW) Equipment Sensor Stimulation

Operator Embedded Training

Off Aircraft

- Portable Maintenance Aid (PMA)
- Aviation Mission Planning Station (AMPS)
  - Full Mission Rehearsal Capability
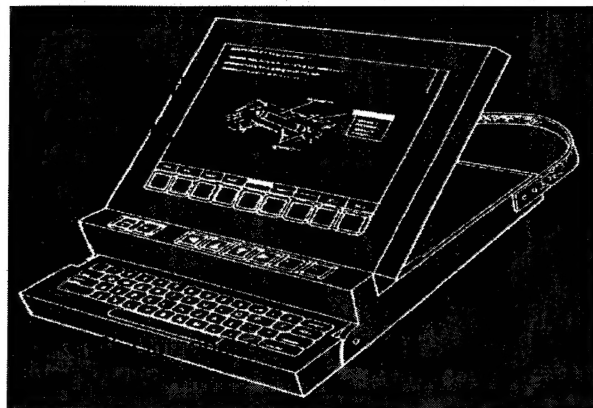
Portable Maintenance Aid (PMA)

- Primary Media for Maintainer Sustainment Training
- Training Faults Embedded in PMA not Aircraft
- Combines with PMA Instrumentation Pack (PIP) for Full Embedded Maintainer Training Capability

COMANCHE MAINTAINER TRAINING DEVICES

Proposed

Rotor/Transmission/Weapons Bays/ Engine/MEP/SPU/ECU Module

Cockpit/Sensor Turret/ Gun Module

Module A
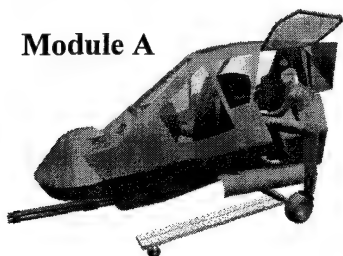
Module B / C

FANTAIL/ Antenna Module

Module D
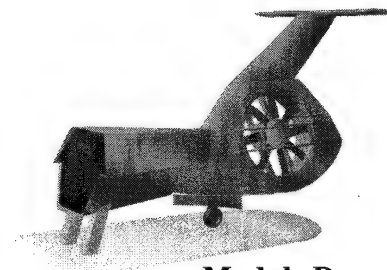
Module F
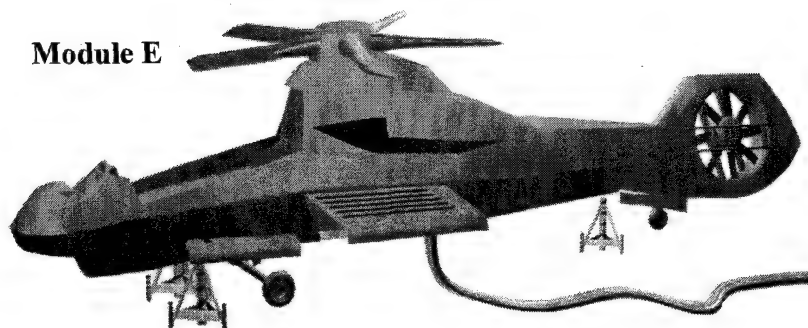
Module E

Landing Gear/Pneudraulic/Fuel Systems Module
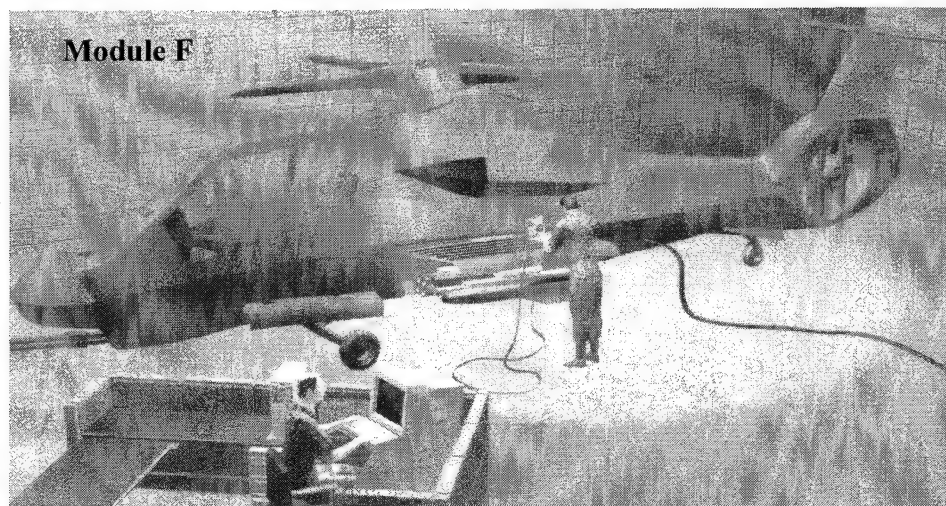
Integrated Composite Maintenance Trainer

PROPOSED OPERATOR TADING DEVICES

PROPOSED OPERATOR TRAINING DEVICES

RAH-66

Initial Individual Training

Collective and Sustainment Training

TRAINING BASE

USING INSTALLATION

Comanche Virtual Cockpit (CVC) **&** Computer Aided Instruction

Computer Aided Instruction **&** Comanche Virtual Cockpit (CVC)
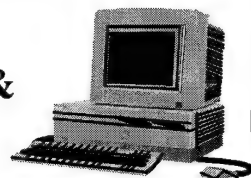
Cockpit Procedures Trainer (CPT)

Comanche Mission Simulator
(Mobile Variant)
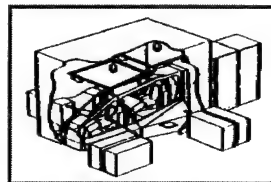
Comanche Mission Simulator
(Hi-Fidelity Cockpit Simulation)

- Motion / Non-Motion ?
- HLA Compliant

- Fidelity ?
- Transportable
- Multiple Cockpits
- HLA Compliant
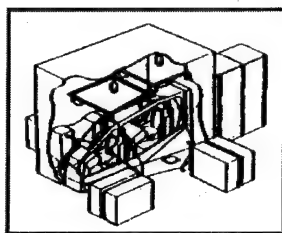
Comanche Aircraft
(Embedded Training)
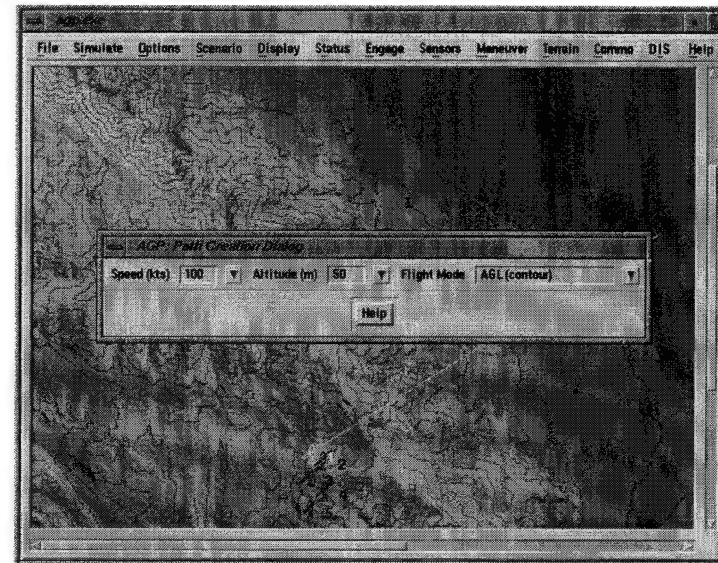
AVCATT / ARMS
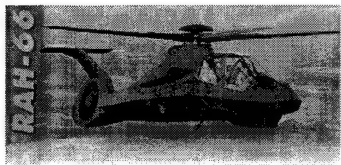
CVC DESKTOP SIMULATOR ELEMENTS

Stealth Viewer for out-the-window view

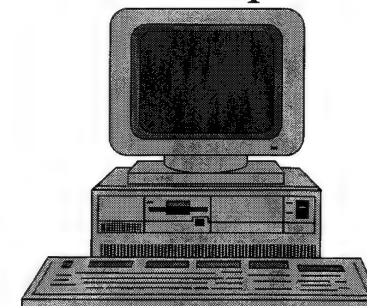ATCOM model for the tactical environment

Comanche VAPS for Pilot Interface

FlyBox

SGI Computer

Two or more processors

**BG Systems
Joystick Control Box**

POTENTIAL UPGRADES

Sound Enhancements
- **Instructions**
- **Error advisement**
- **Simulation realism**

Flat-Panel Displays

Touch-Screen interaction

IR or TV imagery for EOTADS manual scan/stare

Eliminate the need for ATCOM display

Actual Grips with functional switches

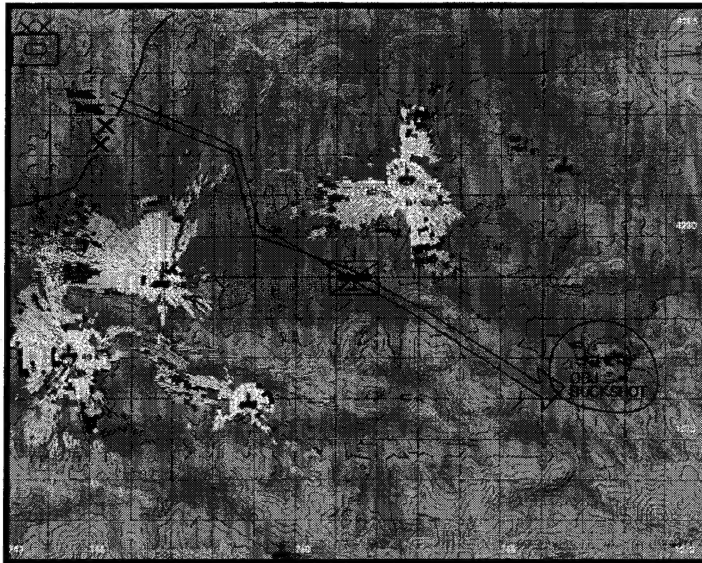Octane with two graphic output devices

FlyBox

Upgrade as required

AdvancedTacticalCOMbat Model

Graphical Display

Stealth Viewer

MaK Technologies VR-Link

Player Interactive Force-on-Force Model
- Stochastic
- Up to Brigade-Level Combat Interactions
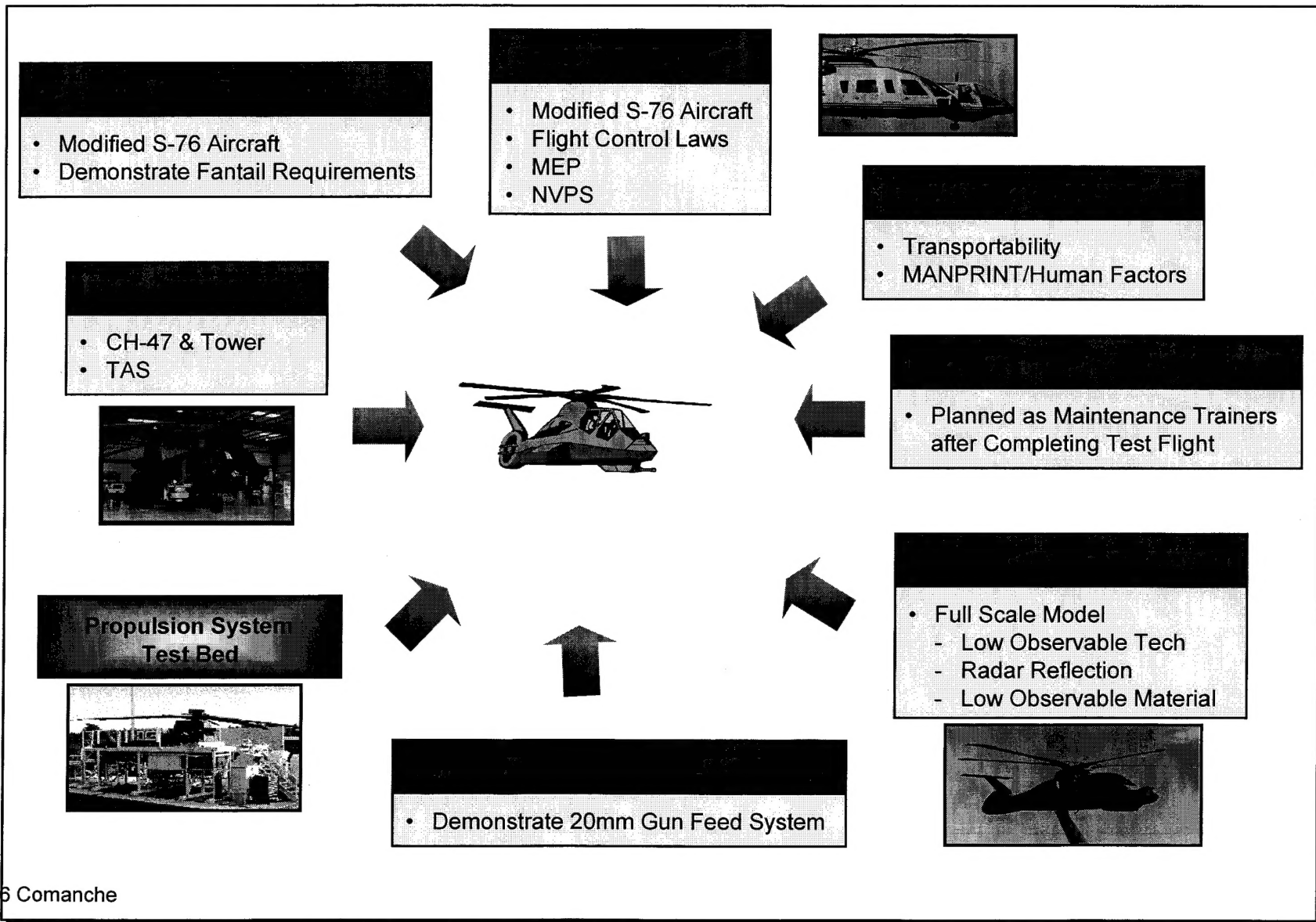- DIS Compliant

High Resolution for Rotorcraft Systems
- Validated Detection Modules
- Validated Radar Clutter & Propagation Modules
- 6-DOF Aerodynamics

RAH-66 Comanche

ADDITIONAL RAH-66 MODELS

- Modified S-76 Aircraft
- Demonstrate Fantail Requirements

- Modified S-76 Aircraft
- Flight Control Laws
- MEP
- NVPS

- Transportability
- MANPRINT/Human Factors

- CH-47 & Tower
- TAS

- Planned as Maintenance Trainers after Completing Test Flight

Propulsion System Test Bed

- Full Scale Model
  - Low Observable Tech
  - Radar Reflection
  - Low Observable Material

- Demonstrate 20mm Gun Feed System

RAH-66 Comanche

COMANCHE IS A SUCCESS STORY

171 Kts Forward
204 Kts TAS (Dive)
75 Kts Left Sideward
65 Kts Right Sideward
70 Kts Rearward Flight

T801
Builds on T800 Success
17% Power Increase

2.0G Pull-Up @ 100 Kts
2.15G Pull-Up @ 120 Kts

PSTB
200 Completed
of 200 Hours MQT
669 Hours Total

First Flight
January 4, 1996

Demonstrated
Integrated
Architecture

112 Flights
124.8 Hours to Date

TSM
Representatives
in Plant

PMA
In Use

Radar Signature
Model Testing
Successful

Combined Test Team
Operational

Dual Mode
"Eye Safe" Laser
Demonstrated
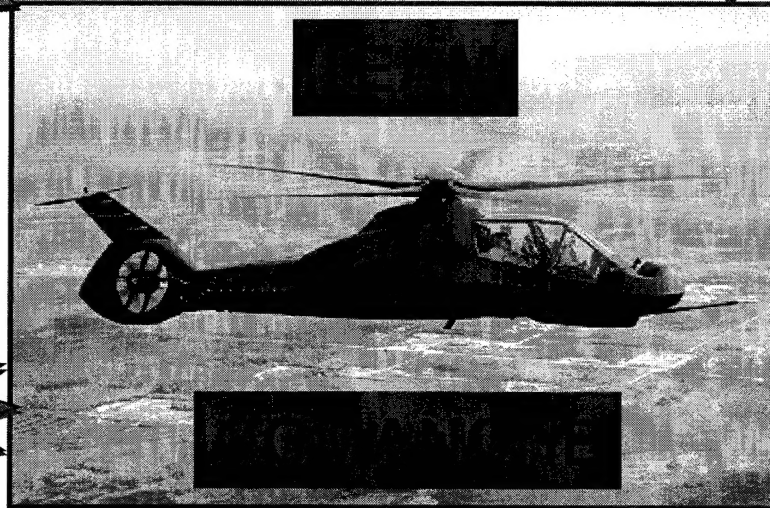
T800
Easily Maintained
Lightweight
High Power
Low Fuel Consumption
Military & Civilian
Qualified

Digital Flight
Control System
Minimizes Pilot
Workload

Force XXI Activities
Global 97
SIMEX - Sep 97
DIV XXI - Nov 97

RAH-66 Comanche
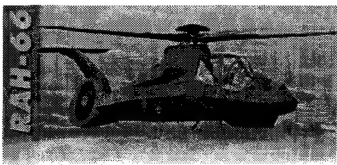
SUMMARY

Put the _INTELLECTUAL_ before the _PHYSICAL_ -

Simulation Based Acquisition

. . . From Concept Exploration Through Operation and Support Provides -

- **Capability Leap Ahead**
  - **Tactics, Techniques & Procedures Development**
  - **Doctrinal Insights**
  - **Technical and Tactical Digital Force Interoperability and Integration**
  - **Individual & Collective Training**
  - **Demonstrate Early Operational Capability Through Simulation**
- **Technical and Operational Testing**
- **Reduced Lifecycle Cost**